AMENDMENTS TO THE CLAIMS

Please amend the claims as indicated in the following listing of all claims:

1. (Currently amended) A method of calculating a linear minimum convolution of a weight value α with a continuous piecewise linear function L including a plurality of line segments connected at knot points, the function L being encoded in computer-readable media, the method comprising:

performing a forward leg sweep over the function L in a first direction with a clipping function comprised of a knot point connecting a first leg of slope α and a second leg of slope $-\alpha$; and

performing a backward leg sweep over the function L in a second direction with the clipping function;

calculating a resultant piecewise linear function based on the forward leg sweep and the backward leg sweep; [[and]]

encoding the resultant piecewise linear function in computer-readable media; and

determining a path through a routing area of an integrated circuit based on at least the resultant piecewise linear function.

2. (Original) The method of claim 1 wherein the performing the forward leg sweep comprises:

selecting a first point of the knot points of the function L as a current point;

removing a portion of the function L if the first leg is determined to clip said portion of the function L;

selecting a next point in the first direction of the knot points of the function L as the current point; and

repeating the determining and the selecting the next point until the determining has been performed for all knot points of the function L.

3. (Original) The method of claim 2 wherein the removing the portion of the function L comprises:

finding an intersection point of the function L in the first direction from the current point at which the first leg intersects the function L;

discarding all knot points between the current point and the intersection point from a list of knot points of the function L; and

inserting the intersection point into the list of knot points of the function L; and wherein the selecting the next point begins with the intersection point as the current point.

4. (Original) The method of claim 2 wherein the first leg is determined to clip said portion of the function L if the absolute value of the slope of the function L is greater than the absolute value of α at all points of said portion of the function L.

5. (Original) The method of claim 2 wherein the first leg is determined to clip said portion of the function L if the value of the function L at all points of said portion are less than the value of the clipping function.

6. (Original) The method of claim 1 wherein the performing the backward leg sweep comprises:

selecting a first point of the knot points of the function L as a current point;

removing a portion of the function L if the second leg is determined to clip said portion of the function L;

selecting a next point in the second direction of the knot points of the function as the current point; and

repeating the determining and the selecting the next point until the determining has been performed for all knot points of the function L.

7. (Original) The method of claim 6 wherein the removing the portion of the function L comprises:

finding an intersection point of the function L in the second direction from the current point at which the second leg intersects the function L;

discarding all knot points between the current point and the intersection point from a list of knot points of the function L; and

inserting the intersection point into the list of knot points of the function L; and wherein

the selecting the next point begins with the intersection point as the current point.

8. (Previously presented) The method of claim 2 wherein a list of knot points of the function L is unaffected each time the second leg is determined not to clip a portion of the function L.

9. (Original) The method of claim 1 wherein the performing the forward leg sweep comprises:

setting an index pointer p to an initial value corresponding to a first end of the function L;

scanning line segments of the function L in a first direction from a first end line segment l_p towards a second end line segment to determine a line segment l_j having a slope greater than the weight α;

defining a forward leg $g(x) = \alpha(x-a_j) + L(a_j)$ where a_j is an x-location on the line segment l_j;

if a line segment l_j is found, scanning in the first direction from the line segment l_j and removing line segments from the function L until an intersecting line segment l_i of the function L intersects the forward leg;

if an intersecting line segment l_i is encountered,

inserting a new segment $g(x) = \alpha(x-a_j) + L(a_j)$ in place of the first removed line segment l_j, wherein the new segment $g(x)$ is defined from intersecting point a_j to the intersection point a_i;

inserting a new segment from the intersection point a_i to the first direction end point of l_i;

incrementing p by two; and

repeating the above steps except the step of setting the index pointer p to the initial value; and

if an intersecting line segment l_i is not encountered, inserting a new segment $g(x)$ in place of the first removed line segment l_j, wherein the new segment $g(x)$ is defined from the first direction end of line segment l_j to the second end of the function L.

10. (Original) The method of claim 1 wherein the function L is a cost function for providing a cost of a path across a segment at various points along the segment.

11. (Currently amended) The method of claim 10 ~~further comprising~~ wherein the determining the path comprises:

providing the weight value α to a processor module;

providing the cost function L to the processor module, wherein the cost function L is a source cost function providing a cost from a source to a segment;

receiving from the processor module an output linear minimal convolution of the weight value α and the cost function L.

12. (Currently amended) The method of claim 11 wherein

the weight value α is a weight for a cost in a first direction;

and ~~the method further~~ wherein the determining the path comprises using the output linear minimal convolution to calculate a clear path in at least the first direction from a first location to a second location.

13. (Currently amended) The method of claim 12 wherein the first and second locations are in a routing area of [[an]] the integrated circuit.

14. (Original) The method of claim 1 wherein

the function L is a continuous piecewise linear function $f(x)$ defined for points λ over an x-axis interval [a,b]; and

the linear minimum convolution $(\alpha * f)(x)$ of the weight value α with the function $f(x)$ is defined as follows:

$$(\alpha * f)(x) = \min_{\lambda \in [a,b]} (f(\lambda) + \alpha |\lambda - x|)$$

15. (Currently amended) A computer program product encoded in computer readable media for calculating a linear minimum convolution of a value with a function, the function including a plurality of line segments connected at knot points, the computer program product comprising:

a software module, executable by an information processing system, for performing a forward leg sweep over the function in a first direction with a clipping function

comprised of a knot point connecting a first leg of a first slope and a second leg of a second slope, the second slope being a negative of the first slope; and

a software module, executable by an information processing system, for performing a backward leg sweep over the function in a second direction with the clipping function.

16. (Previously presented) The product of claim 15 wherein the software module for performing the forward leg sweep comprises:

first instructions, executable by an information processing system for selecting a first point of the knot points of the function as a current point;

second instructions, executable by an information processing system for determining if the first leg clips a portion of the function;

third instructions, executable by an information processing system for selecting a next point in the first direction of the knot points of the function as the current point; and

fourth instructions, executable by an information processing system for repeating the determining and the selecting the next point until the determining has been performed for all knot points of the function.

17. (Currently amended) The product of claim 16 wherein the software module for performing the backward leg sweep comprises:

first instructions, executable by an information processing system for selecting a first point of the knot points of the function [[L]] as a current point;

second instructions, executable by an information processing system for determining if the second leg clips a portion of the function [[L]];

third instructions, executable by an information processing system for selecting a next point in the second direction of the knot points of the function as the current point; and

fourth instructions, executable by an information processing system for repeating the determining and the selecting the next point until the determining has been performed for all knot points of the function [[L]].

18. (Currently amended) The product of claim 17 wherein some of the instructions of the software module for performing the forward leg sweep are also instructions of the software module for performing the backward leg sweep[[:]].

19. (Currently amended) The product of claim 16 further comprising:

fifth instructions, executable by an information processing system if the first leg is determined to clip a portion of the function [[L]], the fifth instructions for finding an intersection point of the function [[L]] in the first direction from the current point at which the first leg intersects the function [[L]];

sixth instructions, executable by an information processing system after the fifth instructions for finding the intersection point, the sixth instructions discarding all knot points between the current point and the intersection point from a list of knot points of the function [[L]]; and

seventh instructions, executable by an information processing system after the sixth instructions for discarding knot points, the seventh instructions inserting the intersection point into the list of knot points of the function [[L]]; and wherein

the third instructions for selecting the next point first select the intersection point as the current point after the fifth instructions find the intersection point.

20. (Currently amended) The product of claim 15 further comprising:

instructions for providing the weight value α to a processor module;

instructions for providing the ~~cost~~ function [[L]] to the processor module, wherein the ~~cost~~ function [[L]] is a source cost function providing a cost from a source to a segment;

instructions for receiving from the processor module an output linear minimal convolution of the weight value α and the ~~cost~~ function [[L].

21. (Original) The product of claim 20 further comprising:

instructions for using the output linear minimal convolution to calculate a clear path in at least the first direction from a first location to a second location.

22. (Original) The product of claim 15 wherein the product is for routing an integrated circuit design.

23. (Original) The product of claim 15 wherein the computer readable media comprises at least one data storage medium, the at least one data storage medium including at least one of the group consisting of:

magnetic disk media;

magnetic tape storage media;

compact disk storage media;

digital video disk storage media; and

nonvolatile memory.

24. (Previously presented) The product of claim 15 wherein the computer readable media comprises at least one data transmission medium, the at least one data transmission medium including at least one of the group consisting of:

a computer network; and

a point-to-point telecommunication system.

25. (Currently amended) An information processing system configured for calculating a linear minimum convolution of a weight value α with a continuous piecewise linear function L including a plurality of line segments connected at knot points, the system comprising:

at least one processor;

a first module ~~configured to be coupled to~~ instantiable in memory of the processor for performing a forward leg sweep over the function L in a first direction with a clipping function comprised of a knot point connecting a first leg of slope α and a second leg of slope $-\alpha$; and

a second module ~~configured to be coupled to~~ instantiable in memory of the processor for performing a backward leg sweep over the function L in a second direction with the clipping function.

26. (Previously presented) The system of claim 25 wherein the modules are software modules encoded on a data-storage computer readable medium coupled to the processor.

27. (Previously presented) The system of claim 25 wherein the system includes computer instructions used by both the first and second modules.

28. (New) The system of claim 25 wherein the function L is a cost function providing a cost of a path across a segment associated with a routing area of an integrated circuit.

29. (New) The system of claim 25 further comprising:

a third module instantiable in memory of the processor for determining a path through a routing area of an integrated circuit based on at least a result of the linear minimum convolution of the weight value α with the function L.